

# *ENOPLOTEUTHIS ANAPSIS*, A NEW SPECIES OF ENOPLOTEUTHID SQUID (CEPHALOPODA: OEGOPSIDA) FROM THE ATLANTIC OCEAN<sup>1</sup>

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## ABSTRACT

A new species of enoploteuthid squid, *Enoploteuthis anapsis*, is described from the tropical Atlantic. Its relationship to *Enoploteuthis leptura* (Leach, 1817), heretofore the only known Atlantic species of the genus, is discussed.

## INTRODUCTION

During a taxonomic study of the cephalopods collected by the DANA deep-sea expeditions in the Atlantic, several specimens of enoploteuthid squid were discovered. Subsequent examination proved them to represent a new species of the genus *Enoploteuthis*. Although this work was part of a larger study of this group of mesopelagic squids, it was felt that the description of the new species should be published with as little delay as possible, since specimens are contained in several European museums and publication will facilitate their further study. A monographic work upon the genus will be published later as a Dana Report.

The majority of the specimens reported upon here is from the Atlantic Dana collection, and I wish to thank the Carlsberg Foundation and, in particular, Dr. E. Bertelsen and the late Dr. Vedel Tåning for making these rich collections available for study. I also wish to thank Mr. Harvey R. Bullis, Jr. for the use of additional material which was collected by the United States Fish and Wildlife Service R/V OREGON. Other material came from the collections made aboard the Institute of Marine Science R/V GERDA. I am grateful to Dr. Malcolm R. Clarke of the National Institute of Oceanography, Wormley, England, for the loan of two male specimens taken by the R/V DISCOVERY. The work was carried out under the guidance of Dr. Gilbert L. Voss, for whose aid and encouragement I am most grateful. To the Bureau of Commercial Fisheries, United States Fish and Wildlife Service, I wish to express my thanks for its continuing support of my studies.

## *Enoploteuthis anapsis*, new species

Figures 1-2

?*Enoploteuthis leptura*, Chun, 1910: 107, pl. 11, figs. 5, 6.

## MATERIAL

*Holotype*: 1 adult female, ML (mantle length) 68.2 mm, OREGON Sta. 1887; 16°55'N 81°10'W; 23 August 1957; USNM 575605.

*Paratypes*: 1 adult female, ML 76.9 mm, Madeira; date unknown; BM (NH) 1958.12.30.22.

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1 adult male, ML 79.0 mm, DISCOVERY Sta. 4743; 32°34'N, 16°45'W; 20 September 1961.

1 adult female, ML 69.0 mm, Madeira; 1 June 1946, BM(NH) 1958.12.30.23.

1 adult male, ML 54.0 mm, DISCOVERY Sta. 4743; 32°34'N, 16°45'W; 20 September 1961.

1 adult female, ML 27.1 mm, DANA Sta. 1292 V; 17°43'N, 64°56'W; 16 April 1922.

1 adult female, ML 73.2 mm, OREGON Sta. unknown; Gulf of Mexico; date unknown.

1 adult female, ML 29.4 mm, GERDA Sta.; 16°55'N, 74°16'W; 10 May 1959; UMML 31.237.

1 adult female, ML 16.9 mm, DANA Sta. 1168 V; 09°30'N, 42°41'W; 12 November 1921.

1 late juvenile female, ML 14.2 mm, DANA Sta. 1238 III; 26°13'N, 78°48'W; 11 February 1922.

1 late juvenile female, ML 13.5 mm, DANA Sta. 1287 III; 16°04'N, 61°52'W; 8 April 1922.

1 late juvenile female, ML 13.4 mm, DANA Sta. 1269 II; 17°13'N, 64°58'W; 15 March 1922.

1 late juvenile female, ML 13.0 mm, DANA Sta. 1247 IV; 17°57'N, 72°51'W; 20 February 1922.

1 late juvenile female, ML 11.1 mm, DANA Sta. 1168 V; 09°30'N, 42°41'W; 12 November 1921.

1 juvenile female, ML 10.0 mm, DANA Sta. 1180 II; 12°11'N, 57°12'W; 20 November 1921.

1 juvenile female, ML 9.8 mm, DANA Sta. 1202 IV; 09°40'N, 79°56'W; 10 January 1922.

In addition to the type material, ten other female specimens were available for examination: 1 adult, ML 64.2 mm, and 9 juveniles, ML 11.0-4.5 mm.

*Description.*—The *mantle* is elongate and conical (Fig. 1). The mantle wall is muscular anteriorly, but posterior to the fins the tip of the mantle becomes thin-walled and saccate. The saccate tip of the mantle is formed by the extension of the mantle integument and not by a continuation of weakened mantle muscle. The mantle musculature terminates at the conus of the gladius. The saccate tip is occupied by a reticulum of numerous, small, fluid-filled compartments which give a honey-combed appearance. A muscle strand extends from the termination of the mantle muscle at the conus to the posterior terminus of the mantle sac. The dorsal mantle margin is produced anteriorly in the midline forming a broad lobe. The ventral margin is slightly concave between the two small ventro-lateral lappets of the mantle-locking apparatus.

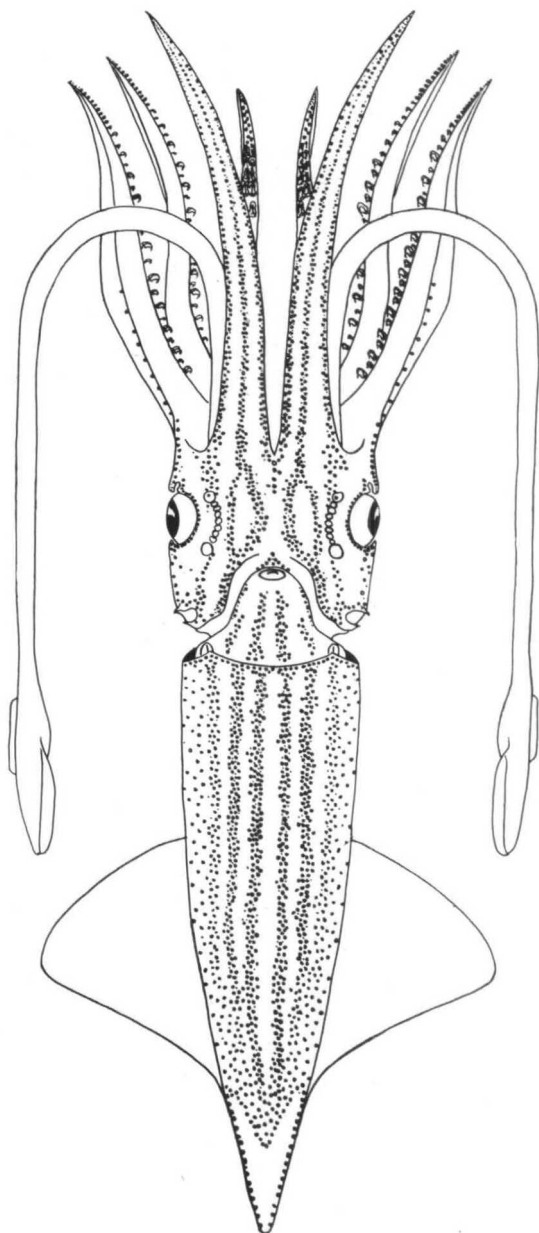


FIGURE 1. *Enoploteuthis anapsis*, n. sp.: holotype, mantle length 68.2 mm, ventral view.

The  *fins* extend anteriorly a little more than half the mantle length and are broader than long. The fins are united posteriorly and terminate anterior to the saccate tip of the mantle.

The  *funnel* is well developed, with thick, muscular walls. The funnel component of the locking apparatus is composed of an oblong cartilaginous structure with a deep longitudinal sulcus which receives the straight cartilaginous ridge of the mantle component. The sulcus is broader and more shallow posteriorly.

The dorsal member of the  *funnel organ* forms a broad, inverted V-shaped patch of tissue. Each limb is elongate with convex antero-lateral margins and bears a deep semicircular lappet which extends nearly to the apex of the dorsal member. The ventral members of the funnel organ are simple, oblong pads which are aligned with the limbs of the dorsal member. The funnel valve is a semicircular flap attached to the antero-dorsal wall of the funnel tube.

The  *head* is nearly round in cross-section and is a little narrower than the mantle width. The posterior dorso-lateral angles of the head contain on each side three nuchal folds. The two dorsal folds are connected and together they form a triangular structure. The ventral fold is in the form of a lappet which contains the ending of the olfactory organ. The eye opening is oblong with rounded margins. The optic sinus extends anteriorly at a level just below that of the pupil.

The  *eye* is large and bulbous with nine nearly circular photophores arranged in a longitudinal row on the ventral surface. The terminal photophores are larger than the seven closely packed intermediates.

The  *buccal membrane* has eight strong supports with connectives attached dorsally to arms I, II, and IV and ventrally to arm III.

The  *arms* are long, subequal in length, with a formula of 4.2.3.1. or 4.3.2.1. The arms are strong, muscular and nearly square in cross-section with the exception of III which is flattened and expanded with a well-developed swimming keel. All arms bear biserial rows of hooks which are replaced by biserial suckers near the arm tips. These suckers grade from small at their point of origin to minute at the attenuate tips of the arms. The outer surface of the sucker ring is granulose distally and smooth proximally. The proximal portion of the aperture is smooth, while the distal border has 5-7 bluntly pointed teeth radiating toward the center of the aperture. The 2-3 middle teeth are the longest with the lateral teeth grading to small knobs.

The  *hectocotylus*, located on the distal one-third of the right ventral arm of the male, consists of modifications of the protective membranes and the absence of certain hooks (Fig. 2c). The ventral protective membrane along the proximal two-thirds of the arm is weakly developed, but at a point between the bases of the 7th and 8th pair of hooks, the membrane

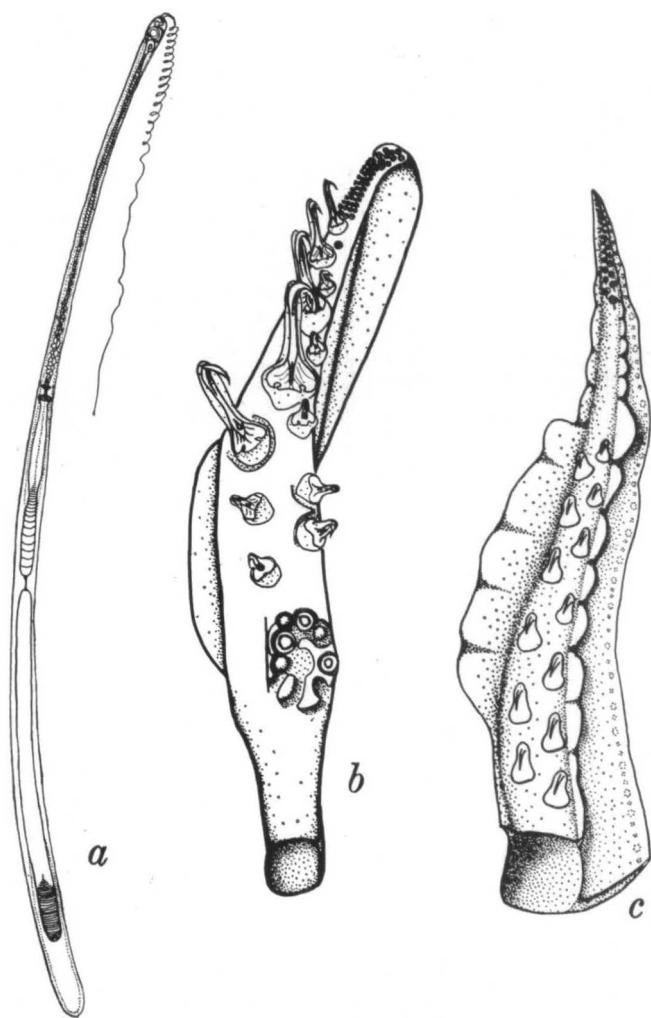


FIGURE 2. *Enoploteuthis anapsis*, n. sp.: a, Spermatophore, 22.4 mm.—b, Tentacular club of holotype.—c, Hectocotylus, right ventral arm.

becomes expanded as a long, convoluted flap. This flap extends along the area occupied by 5-6 pairs of hooks, then both flap and hooks terminate. The ventral protective membrane continues to the arm tip in a series of gentle undulations. The undulated dorsal protective membrane is normal save for an enlarged, slightly thickened flap which arises opposite the distal termination of the large modification of the ventral membrane. Distal to the last pair of hooks the arm is devoid of hooks and suckers for a distance

normally occupied by hooks on an unmodified arm. The tip of the arm is supplied with suckers of the usual size and distribution.

The sperm mass occupies about one-third of the total length of the *spermatophore*, and the cement body measures nearly one-half the length of the sperm mass (Fig. 2a).

The *tentacles* are very long and robust, 1.3 to 2 times longer than the mantle length. The club is well developed, with a distinct carpal cluster, a broad manus, a long, narrow dactylus, and well-developed dorsal and ventral keels (Fig. 2b). The carpal cluster is a raised, ovoid structure consisting of a series of three or four suckers and knobs each, with interconnecting ridges and grooves. The manus displays two rows of graded hooks with 5-7 hooks in each row. The distal hooks in both rows and, especially, the hooks in the mid-section of the ventral row are considerably larger than the others. The long dactylus bears four rows of 40-50 small, papillate suckers.

The chitinous *gladius* has a strong rachis which is rounded anteriorly and forms a heavy midline ridge the length of the gladius. The vane is thin and broad with slightly concave lateral borders. The gladius terminates posteriorly in a bluntly rounded cone.

The ventral surfaces of the mantle, funnel, head, and arms of *E. anapsis* are profusely supplied with small, round photophores which are generally arranged in multiserial longitudinal rows. The distribution and arrangement of these photophores, which give useful specific characters, are shown in Figure 1. The ventral midline of the mantle is devoid of light organs, but lateral to the midline on each side appear two multiserial longitudinal rows which originate at the mantle opening and extend posteriorly. Lateral to the distinct rows a broad band of photophores arises which gradually dissipates toward the dorso-lateral surface of the mantle. Posteriorly all photophore rows lose their distinctiveness, and the saccate tail is devoid of light organs save for a single uniserial row along each lateral surface. The ventral mantle opening is edged by a row of photophores.

The ventral surface of the funnel bears four photophore rows which are aligned with the four distinct rows on the mantle. An additional row appears on each side of the funnel along the dorso-lateral surface.

The head is covered with several rows of light organs in an orderly array. There is a triangular patch of photophores in the apex of the funnel groove. The ventral midline in the posterior part of the head is devoid of photophores, but anteriorly a short row of luminescent organs arises which extends to the junction of the bases of the ventral arms, then divides to send a row of photophores along the entire length of the ventral aboral edge of each arm IV. A multiserial row of photophores originates posteriorly along the edge of the funnel groove and extends anteriorly, first following the curvature of the funnel groove then extending the length of the head and

along the dorsal (lateral) aboral border of the ventral arm at the area of the longitudinal fusion of the tentacular sheath with the arm. At a point in line with the mid-point of the funnel groove, a short row branches from the aforementioned main row, parallels it along the head, then merges with it again just posterior to the base of the ventral arm. From the postero-lateral angle of the head a row of photophores extends anteriorly with a short interruption median to the eye opening, then continues along the lateral edge of the tentacular sheath to the tip of the ventral arm. In the clear area median to the eye opening, the skin and muscle are very thin, forming a window through which may shine the luminescence produced by the photophores on the ventral surface of the eye bulb. A row of light organs extends along the side of the head from the nuchal folds to the posterior margin of the eye opening. A single row of closely packed photophores lines the ventral half of the eye lid and terminates at the optic sinus. Dorsal to the optic sinus a photophore row extends to the lateral (aboral) edge of the ventro-lateral arm, passes along the ventral longitudinal base of the swimming membrane, and terminates about two-thirds of the way along the arm.

The basic arrangement of photophores remains constant for all sizes of specimens examined, but the number of individual photophores increases markedly with increasing size of the animal. With this increase in numbers the distinctiveness of the multiserial photophore rows may become somewhat obscured, but they are never indiscernible.

*Holotype*.—In the United States National Museum (USNM 575605). Paratypes are deposited in the USNM, the Zoological Museum, Copenhagen, the British Museum (Natural History), and the Marine Invertebrate Museum of the Institute of Marine Science, University of Miami.

*Type Locality*.—295 statute miles WSW of Kingston, Jamaica, and 165 statute miles S of Grand Cayman Island, at 16°55'N, 81°10'W. OREGON Sta. 1887, 23 August 1957.

*Distribution*.—Tropical Atlantic, Caribbean Sea, Madeira.

*Etymology*.—The specific name, *anapsis*, is derived from the Greek word meaning "a lighting up" or "appearance of the stars." Either meaning, it would seem, aptly describes this squid, whose luminescent display in life must be truly magnificent.

*Discussion*.—Chun (1910) briefly described and illustrated a young male of *Enoploteuthis leptura* from the VALDIVIA collections from the South Atlantic. Although Chun's description is short and inadequate, his illustrations of the tentacular club and of the ventral surface of the animal clearly indicate that the specimen should be referred to *E. anapsis*.

Of the four other nominal species of *Enoploteuthis*, only one, *E. leptura*, is recorded from the Atlantic. A detailed redescription of the poorly known

*E. leptura* and a discussion of the remaining species in the genus are included in a larger work which will appear later.

In *E. anapsis*, the arm tips are more attenuate and the sucker-bearing area is greater than in *E. leptura*. The sucker rings of *E. anapsis* bear 5-7 teeth, while those of *E. leptura* possess 9 longer, more slender teeth.

The two species are readily distinguishable by the character of their tentacles and clubs. *E. anapsis* has very robust, long tentacles, two to three times the length of the arms. In *E. leptura*, the tentacles are thin and short, not much longer than the arms. The tentacular club of *E. anapsis* is large, expanded, and has broad, well-developed dorsal and ventral keels, while the club of *E. leptura* is small, narrow, and bears only a poorly developed dorsal keel and no ventral keel. The dactylus of *E. anapsis* possesses four rows of 40-50 small suckers which decrease slightly in diameter toward the expanded tip, where fewer than ten slightly enlarged suckers appear. The dactylus of *E. leptura* bears two rows of about 10-15 small to minute suckers which continue to decrease in diameter toward the pointed tip. The carpal cluster of *E. anapsis* is broad and rectangular with three to four suckers and corresponding knobs plus three to four interlocking ridges and grooves. In *E. leptura* the carpal cluster is long and narrow with five to six suckers with corresponding knobs, but there are no interlocking ridges and grooves as in *E. anapsis*.

The arrangement of photophores differs in the two species. While the midline of the ventral surface of the mantle in *E. anapsis* is devoid of a photophore row, the midline in *E. leptura* is covered by a row which curves to either side to meet the next lateral row just posterior to the mantle margin. *E. anapsis* possesses a single, isolated patch of light organs in the midline apex of the funnel groove, but *E. leptura* has two small patches which are continuous with the two innermost longitudinal rows extending along the head and onto the ventral aboral border of the ventral arms, leaving the entire midline of the head and funnel groove devoid of photophores. The corresponding photophore rows along the ventral aboral border of the ventral arms in *E. anapsis* originate as a single row in the head midline which bifurcates at the bases of arms IV where they divide.

A comparison of the hectocotyli of these two species reveals that *E. leptura* has all of the right ventral arm hooks and suckers in the normal position and number, while *E. anapsis* lacks several pairs of hooks at the distal ends of the hook rows. There is little difference between the modifications of the long flap of the ventral protective membranes, but the small flap on the dorsal protective membrane is smaller in *E. leptura* than in *E. anapsis*.

A striking difference in the arms of males exists between the two species. The first three pairs of arms in the male of *E. leptura* possess numerous minute papillae over the entire oral surfaces between the hooks and suckers.



There are no papillae on the ventral arms. Males of *E. anapsis* show no indication of papillation on any of the arms.

Some other members of the Enoploteuthidae have this interesting, though unevaluated, character. *Abraliopsis affinis* Pfeffer is reported by Hoyle (1904), who referred this species to *A. hoylei*, to possess papillae on all of the arms of the males. These are located on the edge of each "lappet" (trabecula) and at the base of each arm where they increase in numbers from three to four on the dorsal arms to "about a dozen" on the right ventral arm. The hectocotylus on the left ventral arm also bears papillae. Chun (1910) records similar papillae in a species he calls *Abraliopsis morisii*, which in all probability should be referred to *A. affinis* or *A. lineata*. It is interesting that this male-associated character is exhibited in some, but not all, species of at least two genera of the Enoploteuthidae.

#### SUMARIO

*Enoploteuthis anapsis*, UNA NUEVA ESPECIE DE CALAMAR ENOPLOTEUTIDO (CEPHALOPODA: OEGOPSIDA) DEL OCÉANO ATLÁNTICO

Se da la descripción de *Enoploteuthis anapsis*, una nueva especie de calamar enoploteutido del Océano Atlántico, con una discusión de su relación con *Enoploteuthis leptura* (Leach, 1817). La nueva especie se distingue por los siguientes caracteres: cuatro hileras de fotóforos en la superficie ventral del manto, con la línea media libre de órganos luminosos; largos y robustos tentáculos; larga y extensible maza, con membrana dorsal y ventral, aparato conectivo levantado y rectangular, largo dactilo con muchas ventosas y dos filas de uñas alargadas, las de la fila ventral muy alargadas; de 5-7 dientes en los anillos de ventosas del brazo; hectocotilo con membranas protectoras alargadas y sin varios pares de ganchos; espermatóforo con masa de esperma relativamente corta y largo cuerpo adhesivo.

*Enoploteuthis leptura* puede ser rápidamente diferenciada de *Enoploteuthis anapsis* por la presencia de los siguientes caracteres: una hilera de fotóforos en la línea media ventral del manto, que se curva para unirse a la primera fila de fotóforos a cada lado de la línea media; tentáculos cortos y finos; pequeña maza sin membrana ventral, aparato conectivo estrecho, dactilos pequeños con escasas ventosas, sin uñas desproporcionadamente alargadas; 9 largos y delicados dientes en los anillos de ventosas del brazo; hectocotilo con filas de uñas normales; espermatóforo con larga masa de esperma y corto cuerpo adhesivo.

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